

CLAIMS

WHAT IS CLAIMED IS:

1. A flash control device for use with an electronic flash device having switchable flash modes as a discrete flash mode for a discrete flash and an FP flash mode for an FP flash, the
5 flash control device comprising:
 - a distance input part for inputting an object distance;
 - a calculating part for calculating a proper flash intensity in accordance with the object distance and an f-number, a sensitivity, and an exposure time of a camera when the electronic flash device is in the FP flash mode, and for calculating the proper flash intensity in
10 accordance with the object distance, the f-number, and the sensitivity when the electronic flash device is in the discrete flash mode, the proper flash intensity being a degree of intensity necessary for illuminating an object with a proper light amount; and
 - an emission control part for instructing the electronic flash device to flash with the proper flash intensity, wherein
- 15 flash control is performed so that the object is illuminated with the proper exposure amount.
2. The flash control device as set forth in claim 1, wherein
when the electronic flash device is in the discrete flash mode, the calculating part calculates the proper flash intensity which is proportional to a square of the object distance
20 and a square of the f-number and is inversely proportional to the sensitivity; and
when the electronic flash device is in the FP flash mode, the calculating part calculates the proper flash intensity so that it is proportional to the square of the object distance and the square of the f-number and is inversely proportional to the sensitivity and the exposure time.
- 25 3. The flash control device as set forth in claim 1, wherein:

when the exposure time is shorter than an X-Sync shutter speed of a shutter of the camera, the emission control part switches the flash mode of the electronic flash device to the FP flash mode; and

- when the flash mode of the electronic flash device is switched, the calculating part
- 5 calculates a new proper flash intensity without changing the object distance.

4. The flash control device as set forth in claim 3, wherein:

when the electronic flash device is in the discrete flash mode, the calculating part determines whether or not the proper flash intensity is within a range in which the electronic flash device is emittable of the discrete flash;

- 10 when the proper flash intensity is larger than a maximum flash intensity of the discrete flash, the calculating part instructs the camera to perform at least one of an operation for decreasing the exposure time and the f-number and an operation for increasing the sensitivity; and

- when the proper flash intensity is smaller than a minimum flash intensity of the discrete flash, the emission control part switches the flash mode of the electronic flash device to the FP flash mode.

5. The flash control device as set forth in claim 4, wherein:

- when the electronic flash device is in the FP flash mode, the calculating part determines whether or not the proper flash intensity is within a range in which the electronic flash device is emittable of the FP flash;

- when the proper flash intensity is larger than a maximum flash intensity of the FP flash, the calculating part instructs the camera to increase the f-number and lengthen the exposure time to a value longer than the X-Sync shutter speed, and the emission control part switches the flash mode of the electronic flash device to the discrete flash mode; and

- 25 when the proper flash intensity is smaller than the minimum flash intensity of the FP

flash, the calculating part instructs the camera to decrease the sensitivity.

6. The flash control device as set forth in claim 5, further comprising a warning part for issuing a warning, wherein:

the calculating part has an acquiring part for acquiring, as a measured distance, a
5 distance between the object and the camera, the distance being measured by the camera;

when the object distance has not been input, the calculating part calculates the proper flash intensity in accordance with the measured distance instead of the object distance; and

10 the warning part issues a warning when the calculating part determines that the measured distance is largely different from the object distance.

7. The flash control device as set forth in claim 1, wherein

the calculating part determines whether or not the proper flash intensity is within a range in which the electronic flash device is emittable, and calculates, when the proper flash intensity falls outside the emittable range, a modified value of at least one of the object
15 distance, the f-number, the sensitivity, and the exposure time so as to allow the proper flash intensity to be a value within the emittable range.

8. The flash control device as set forth in claim 1, wherein:

when the electronic flash device is in the FP flash mode, the calculating part determines whether or not the proper flash intensity is larger than a maximum flash intensity
20 of the FP flash; and

upon determining that the proper flash intensity is larger than the maximum flash intensity, the calculating part instructs the camera to increase the f-number and lengthen the exposure time to a value longer than an X-Sync shutter speed of a shutter of the camera, and the emission control part switches the flash mode of the electronic flash device to the discrete
25 flash mode.

9. The flash control device as set forth in claim 1, wherein:

when the electronic flash device is in the discrete flash mode, the calculating part determines whether or not the proper flash intensity is larger than a maximum flash intensity of the discrete flash; and

5 upon determining that the proper flash intensity is larger than the maximum flash intensity, the calculating part instructs the camera to perform at least one of an operation for decreasing the exposure time and the f-number and an operation for increasing the sensitivity.

10. The flash control device as set forth in claim 1, wherein:

10 when the electronic flash device is in the discrete flash mode, the calculating part determines whether or not the proper flash intensity is smaller than the minimum flash intensity of the discrete flash; and

upon determining that the proper flash intensity is smaller than the minimum flash intensity, the emission control part switches the flash mode of the electronic flash device to

15 the FP flash mode.

11. The flash control device as set forth in claim 1, wherein:

when the electronic flash device is in the FP flash mode, the calculating part determines whether or not the proper flash intensity is smaller than a minimum flash intensity of the FP flash; and

20 upon determining that the proper flash intensity is smaller than the minimum flash intensity, the calculating part instructs the camera to decrease the sensitivity.

12. The flash control device as set forth in claim 1, further comprising a warning part for issuing a warning, wherein:

the calculating part has an acquiring part for acquiring, as a measured distance, a
25 distance between the object and the camera, the distance being measured by the camera; and

the warning part issues a warning when the calculating part determines that the measured distance is largely different from the object distance.

13. The flash control device as set forth in claim 12, wherein

when the object distance has not been input, the calculating part calculates the
5 proper flash intensity in accordance with the measured distance instead of the object distance.

14. The flash control device as set forth in claim 1, further comprising a notifying part for notifying a recommended object distance to a user, wherein:

the calculating part determines whether or not the proper flash intensity is larger
10 than a maximum flash intensity of the electronic flash device, and calculates, upon determining that the proper flash intensity is larger than the maximum flash intensity, as the recommended object distance, the object distance at such a value that the proper flash intensity becomes closest to the maximum flash intensity of the electronic flash device; and

the calculating part determines whether or not the proper flash intensity is smaller
15 than a minimum flash intensity of the electronic flash device, and calculates, upon determining that the proper flash intensity is smaller than the minimum flash intensity, as the recommended object distance, the object distance at such a value that the proper flash intensity becomes closest to the minimum flash intensity of the electronic flash device.

15. The flash control device as set forth in claim 1, further comprising a notifying part for
20 notifying a recommended object distance to a user, wherein:

the calculating part determines whether or not the proper flash intensity is within a range in which the electronic flash device is emittable;

when a maximum flash intensity of the electronic flash device has become smaller
25 than the proper flash intensity due to a variance in at least one of the f-number, the exposure time, and an illuminating angle of a light-emitting part of the electronic flash device, the

calculating part calculates as the recommended object distance the object distance at such a value that the proper flash intensity becomes closest to the maximum flash intensity of the electronic flash device; and

when a minimum flash intensity of the electronic flash device has become larger than
5 the proper flash intensity due to a variance in at least one of the f-number, the exposure time, and the illuminating angle, the calculating part calculates as the recommended object distance the object distance at a such value that the proper flash intensity becomes closest to the minimum flash intensity.

16. The flash control device as set forth in claim 1, further comprising a warning part for
10 issuing a warning, wherein:

the calculating part determines whether or not the proper flash intensity is within a range in which the electronic flash device is emittable; and

the warning part issues a warning when the proper flash intensity falls outside the emittable range due to a variance in at least one of the f-number, the exposure time, and an
15 illuminating angle of a light-emitting part of the electronic flash device.

17. The flash control device as set forth in claim 16, further comprising a notifying part for notifying a recommended object distance to a user, wherein:

when a maximum flash intensity of the electronic flash device has become smaller than the proper flash intensity due to a variance in at least one of the f-number, the exposure
20 time, and the illuminating angle, the calculating part calculates as the recommended object distance, the object distance at such a value that the proper flash intensity becomes closest to the maximum flash intensity of the electronic flash device; and

when a minimum flash intensity of the electronic flash device has become larger than the proper flash intensity due to a variance in at least one of the f-number, the exposure time,
25 and the illuminating angle, the calculating part calculates as the recommended object

distance the object distance at a such value that the proper flash intensity becomes closest to the minimum flash intensity.

18. the flash control device as set forth in claim 17, further comprising a warning part for issuing a warning, wherein:

5 the calculating part has an acquiring part for acquiring, as a measured distance, a distance between the object and the camera, the distance being measured by the camera; when the object distance has not been input, the calculating part calculates the proper flash intensity in accordance with the measured distance instead of the object distance; and

10 the warning part issues a warning when the calculating part determines that the measured distance is largely different from the object distance.

19. An electronic flash device having switchable flash modes as a discrete flash mode for a discrete flash and an FP flash mode for an FP flash, the electronic flash device comprising:

 the flash control device as set forth in claim 1; and

15 a light-emitting part.

20. A photographing system, comprising:

 an electronic flash device having the flash control device as set forth in claim 1 and a light-emitting part, and having switchable flash modes as a discrete flash mode for a discrete flash and an FP flash mode for an FP flash; and

20 a camera having an image pickup part for picking up an image of an object.